γ+jet calibration in CMS
The event selection and errors of calibration

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For improvement of energy balance between jet and photon events selection is performed for a set of variables:

ET_jet2 − **transverse energy of second leading jet**

phi_gam_jet − **angle between gamma and jet**

Et_isol_gam − **the sum of ET cells in R=0.7 around gamma**

Et_isol_jet − **the sum of ET cells in 0.7<R<1 around jet**

Et_out − **the sum of ET cells that are not occupied neither by gamma nor by jet**

These selections can give some systematical uncertainties which need to be evalutaed.

Investigations were made with:

PYTHIA6.156, CMSJET4.703, CMSIM121
ORCA_4_5_1

Samples for analysis:

Events with direct photons from Spring01 production

Parameter	1	2	3	4
Ptmin(g)	20	40	100	200
Ptmax(γ)	40	100	200	300
Nevents	###	###	###	###

Some PYTHIA parameters

Parameter	Value	
Process	Isub=14	f+f~−>g+γ
	Isub=29	f+g−>f+γ
Multiple interactions	Mstp(82)=4	
Pthardmin	Ptmin(γ)/2	
Pthardmax	2*PTmax(g)	

Analysis levels:

PARTICLE − CMSJET without field and smearing
FIELD − CMSJET with field and smearing
ORCA − CMSIM121+ORCA_4_5_1

Corrections to PT of jet.

Unsertainties:

D_1: limitations on some parameters lead to the effect that relative number of events with Etjet>Etgamma or Etjet<Etgamma can be increased.
The energy disbalance(F=PTgamma−PTjet) is shifted.

D_2: depends on correlation coefficient between Ptgamma and Ptjet.

<Ptjet>(Ptgamma)=k1*Ptgamma, 0<k1<1

<Ptgamma>(PTjet)=k2*Ptjet, k2=k1

A) **<F>(Ptgamma)=Ptgamma−<Ptjet>=**
=(1−k1) * Ptgamma > 0

B) <F>(Ptjet)=<Ptgamma>−Ptjet=
=(k2−1) * Ptjet < 0

After cuts : Δ|<F>|=|<F>+Δ<F>|−|<F>|

A) Δ**|<F>|=Δ<F>**
B) Δ**|<F>|=−Δ<F>**

Using |<F>| it is impossible to evaluate systematical uncertainties

Benchmark sample should be used for determination D_1, D_2, sigma (statistical uncertainty).

Ptjet_corr=Ptjet(1+D_1+D_2+−sigma)

Uncertainties for 50% signal suppression.

Correction D_1 (%)

	Particle	Field	SMEAR	ORCA
No cuts	0	0	0	0
Et_jet2/ETgam	0.2	0.3	0.2	0.2
180_phi_gam_jet	0.9	0.9	1.1	0.7
Etisol_gam/Etgam	−1.7	−1.8	−1.7	−0.9
Etisol_jet/Etjet	4.7	4.1	4.5	4.8
Etout/Etgam	1.4	1.9	1.6	0.5
Etmiss/Etgam	−0.6	0.6	0	2.6

The largest influence is from isolation of jet.

Correction D_2(%)

	Particle	Field	SMEAR	ORCA
No cuts	5.5	5.5	5.5	5.5
Et_jet2/ETgam	3.6	3.6	3.8	4.3
180_phi_gam_jet	4.6	4.6	4.6	4.8
Etisol_gam/Etgam	5.3	5.2	6.2	5.5
Etisol_jet/Etjet	5.5	5.5	5.5	5.6
Etout/Etgam	3.2	3.6	3.4	0.5
Etmiss/Etgam	5.3	5.2	5.1	5.4

The lowest influence is from suppression of second jet and Etout.

Summary

Results obrained are the same on PARTICLE, CMSIM and ORCA level.

In nearest future the same investigation will be performed with background and low luminosity pile−up.